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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/662,817	09/16/2003	Patrick Briot	PET-2100	1105
23599	7590	08/04/2006	EXAMINER	
MILLEN, WHITE, ZELANO & BRANIGAN, P.C. 2200 CLARENDON BLVD. SUITE 1400 ARLINGTON, VA 22201			SINGH, PREM C	
			ART UNIT	PAPER NUMBER
			1764	

DATE MAILED: 08/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/662,817

Applicant(s)

BRIOT ET AL.

Examiner

Prem C. Singh

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

The objection to specifications is withdrawn.

Amendment to claims 1, 5, 11, 17, and 19-22, and addition of new claims 26-31 is noted.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-11, 13-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoo et al (US Patent 3,945,914).

Yoo invention discloses a process for producing a hydrocarbon material of reduced sulfur content which comprises:

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(1) Contacting a sulfur-containing hydrocarbon material with an oxidant to preferentially oxidize at least a portion of the sulfur and form an oxidized sulfur containing hydrocarbon material;

(2) Contacting the oxidized sulfur-containing hydrocarbon material with at least one additional metal-containing component at a temperature within the range from about 500°F to about 1350°F, the additional metal-containing component comprising a metal selected from the group consisting of nickel, molybdenum, cobalt, tungsten, iron, zinc, vanadium, copper, manganese, mercury, and mixtures thereof; and

(3) recovering a hydrocarbon material of reduced sulfur content.

(Column 1, lines 45-63).

The sulfur content of these materials may be greater than about 1% by weight (Column 1, lines 66-68). Additional examples of suitable hydrocarbon materials include cracked gas oils, residual fuel oils, topped or reduced crudes, crude petroleum from which the lighter fractions are absent (Column 2, lines 9-12). "Typical examples of 2,3,4, and 5-ring thiophene containing materials found in heavy hydrocarbon materials which are difficult to remove include benzothiophene, dibenzothiophene." (Column 2, lines 18-21). "Included among the oxidants which may be used for such oxidation are oxygen (often in the form of oxygen-containing gases, e.g., air), ozone, hydrogen peroxide, organic peroxides, organic hydroperoxides and organic peracids, as well as inorganic peroxy compounds such as inorganic peroxides and the like. The oxidation preferably takes place in the presence of a metal-containing catalyst (Column 2, lines 37-44).

Yoo invention further discloses that the temperature utilized in carrying out the oxidation step can vary over a wide range. Preferably, a temperature within the range from about 20°F to about 450°F may be employed, although higher and lower temperatures can be utilized (Column 2, lines 64-68). The sulfur-oxidizing step of this invention, in general, may be carried out over a broad range of pressures, preferably at a pressure in the range from about 1 atmosphere to about 100 atmospheres or more (Column 3, lines 8-12). The catalysts which may be utilized to promote the oxidation of sulfur contained in the hydrocarbon material using the preferred oxidants are the catalysts selected from Group IV-B, Group V-B, and Group VI-B metals. These catalysts can be incorporated into the present process by any means known to those skilled in the art, and can be included in either a homogeneous or heterogeneous catalyst system (Column 4, lines 7-14). The preferred catalyst metals are titanium, zirconium, vanadium, tantalum, chromium, molybdenum, tungsten, and mixtures thereof, with molybdenum being the more preferred catalyst metal (Column 4, lines 29-33). The molybdenum metal useful in the preparation of the particularly preferred molybdenum-containing catalyst may be in the form of lumps, sheets, foil, or powder (Column 6, lines 21-24). The molybdenum metal-peroxy compound interacting may be carried out at a wide range of temperatures for example, within the range of from about 25°C to about 100°C (Column 6, lines 30-33). Typical interacting pressures may range from about 1 psia to about 100 psia (Column 6, lines 35-36). After the interacting has been carried out for a desired length of time, e.g., from about 5 minutes to about 30 hours, the reaction mass may be filtered to separate the insoluble molybdenum from the catalyst mixture (Column

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6, lines 37-41). Following the oxidation step, the hydrocarbon materials may be separated from lower boiling materials, such as oxidant decomposition products, solvent, various catalyst components, cracked hydrocarbons and the like. Some sulfur-containing compounds may also be removed at this point. This separation may be performed using conventional procedures, such as flashing, stripping, simple distillation, and the like procedures. Alternatively, the entire oxidation reaction mass may be used in the contacting of step (2) of the present process (Column 6, lines 44-54). The metal-containing component for use in the treating step may include elemental metal, elemental metal or metal-containing compounds, e.g., oxide, supported on a catalyst carrier, e.g., alumina, soluble metal-containing compounds and the like (Column 7, lines 57-62). In order to achieve the maximum benefits of the present invention, it is preferred that the particularly preferred oxidation catalyst be utilized in both the contacting of the steps (1) and (2) of the present invention (Column 8, lines 38-42).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo et al (US Patent 3,945,914) in view of Ho et al US Patent (5,958,224).

Yoo invention mentions conventional procedures, such as flashing, stripping, and simple distillation, but does not mention an adsorption step to separate oxidized sulfur-containing compounds.

Ho invention discloses a process for removing hard sulfurs from hydrocarbon streams comprising: selectively oxidizing hard sulfurs in a hydrotreated stream, under oxidizing conditions in the presence of an effective amount of an oxidizing agent, wherein the said oxidizing agent is a peroxometal complex and wherein said hard sulfurs are oxidized into the corresponding sulfoxides and sulfones. The invention is further directed to a process according to the above wherein the process further comprises adsorbing said oxidation products and recovering a product stream having a reduced concentration of hard sulfurs and oxidation products (Column 1, lines 43-54). Non-limiting examples of such adsorbents, commonly known to the skilled artisan, include activated carbons, activated bauxite, activated clay, activated coke, alumina, and silica gel (Column 3, lines 9-12).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Yoo by using an adsorption step, disclosed by Ho invention, to make the process more economical.

### ***Response to Arguments***

It is argued that the Applicants' catalyst is specified as being in bulk form and wherein the metal of the metallic oxide catalyst is from groups IV-B, V-B or VI-B of the periodic table. Since in the Yoo invention the insoluble molybdenum is filtered, it is clear that the catalyst mixture is a solution, i.e. a homogeneous catalyst.



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The Applicant's argument is not persuasive because Yoo invention discloses, "The preferred oxidants are catalysts selected from Group IV B, V B, and VI B metals. These catalysts can be incorporated into the present process by any means known to those skilled in the art, and can be included in either a homogeneous or heterogeneous catalyst system." (Column 4, lines 9-14). "The metal containing component for use in the treating step may include elemental metal, elemental metal or metal-containing compounds, e.g., oxide, supported on a catalyst carrier." (Column 7, lines 57-61).

The Applicant argues that the Yoo process requires two steps and the claimed process can be conducted in a single stage.

The Applicant's argument is not persuasive because Yoo discloses, "Following the oxidation step the hydrocarbon material may be separated, alternately, the entire oxidation reaction mass may be used in the contacting of step (2) of the present process (Column 6, lines 44-54).

The Applicant argues that Yoo needs hydrogen to maintain high pressures in a closed vessel. The Applicant's invention resides in avoiding the consumption of hydrogen and this advantage is set forth in Applicant's claims 5 and 11.

The Applicant's argument is not persuasive because Yoo discloses, "In a preferred embodiment, the contacting of step (2) takes place in the essential absence of added free molecular hydrogen." (Column 7, lines 7-9).

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The Applicant argues that Yoo invention would lead one of ordinary skill to employ the heterogeneous catalyst, and certainly not Applicant's bulk catalyst of oxides from IV b, V B, or VI B.

The Applicant's argument is not persuasive because Yoo mentions, "The metal containing component for use in the treating step may include elemental metal, elemental metal or metal-containing compounds, e.g., oxide, supported on a catalyst carrier." (Column 7, lines 57-61). Yoo also adds, "The preferred oxidants are catalysts selected from Group IV B, V B, and VI B metals.

The Applicant argues that there is no mention of sulfur compounds containing benzothiophene or dibenzothiophene which are specifically set forth in Applicant's claims 29-31.

The Applicant's argument is not persuasive because Yoo discloses, "Typical examples of 2,3,4, and 5-ring thiophene containing materials found in heavy hydrocarbon materials which are difficult to remove include benzothiophene, dibenzothiophene." (Column 2, lines 18-21).

The Applicant argues using 70, 90, and 98% of the metallic oxide in the catalyst.

The Applicant's argument is not persuasive because although Yoo uses 9.7% wt molybdenum oxide in a preferred embodiment (Column 10, lines 30-31), the invention also discloses using the catalyst in the form of lumps, sheets, foil, or powder (Column 6,

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lines 21-24). It would have been obvious to one skilled in the art to take molybdenum oxide powder and use as such (100% of the catalyst) in the process.

The Applicant argues conducting oxidation at a temperature below 200°C, which is significantly lower than the minimum temperature set forth in the reference for step (2).

The Applicant's argument is not persuasive because Yoo uses a temperature of 500 to 1350°F in step (2), while the temperature in the oxidation step (step (1)) is 20°F to 450°F (Column 2, lines 64-67).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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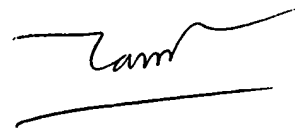
the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 6:30 AM-3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ps/072706

A handwritten signature in black ink, appearing to read 'Lam', is written above a horizontal line.